

The Importance of H₂O



Why is Water Important?

- Water regulates the Earth's temperature. It also regulates the temperature of the human body!
- 80 % of the Earth's surface is water. (Only 2.5% is fresh water.)
- The human body is approximately 66% water.
- Recreational uses (swimming, boating, skiing...)
- A person can go about one month without food... but only one week without water.

If Water is Important...

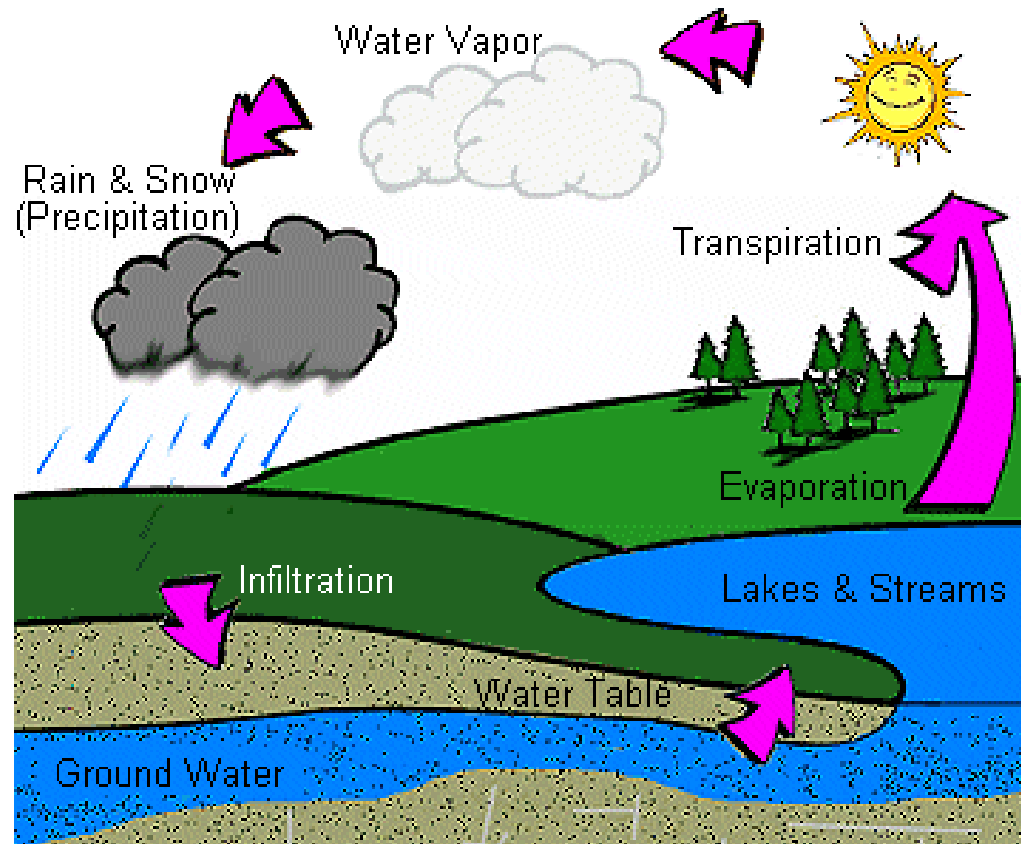
Then is the quality of water
important?

And how does it move around the
Earth?

The Water Cycle

- This is how water moves around the Earth.
 - It is also how “Mother Nature” cleans the water.
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The Water Cycle

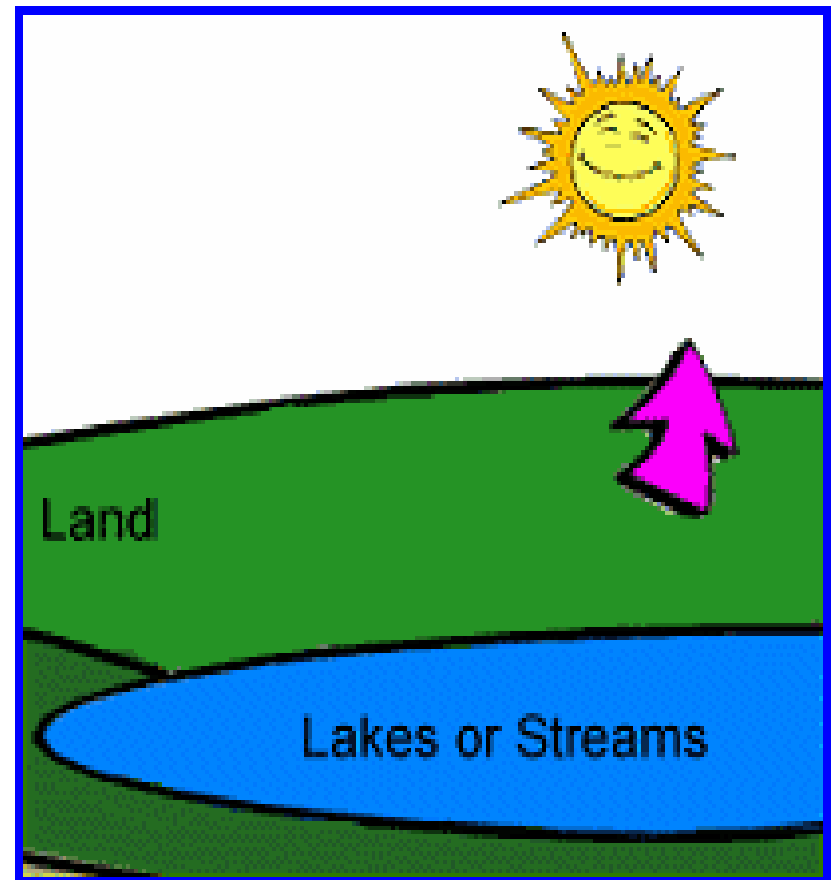


Thanks to Wisconsin Department of Natural Resources

and their site www.dnr.wi.gov/eeek/



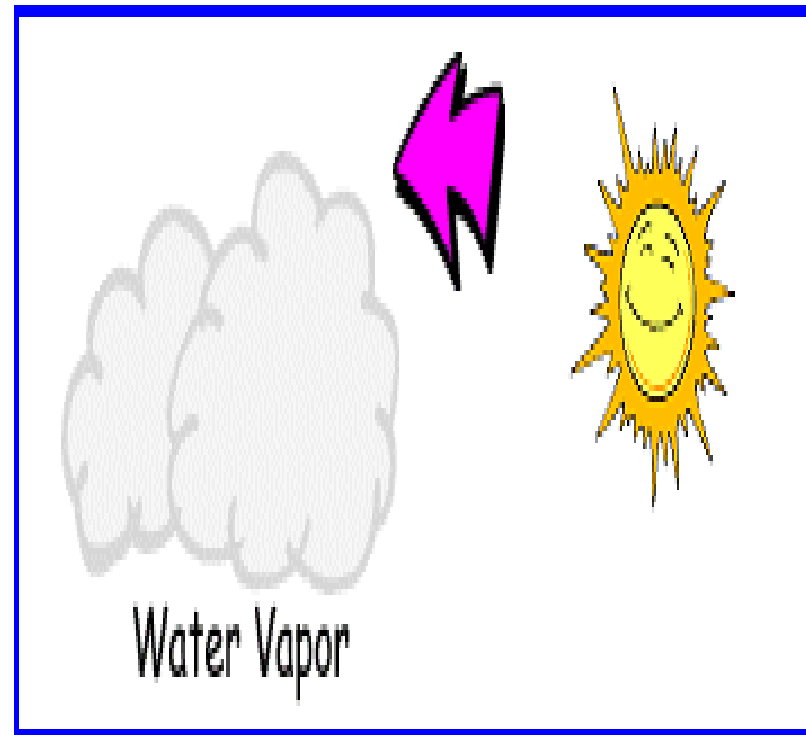
- **Up, Up in the Air = Evaporation**
- Warmth from the sun causes water from lakes, streams, ice, and soils to turn into water vapor in the air. Almost all of the precipitated water (80 percent) goes right back into the air because of evaporation. The rest runs off the land or soaks into the ground to become ground water.



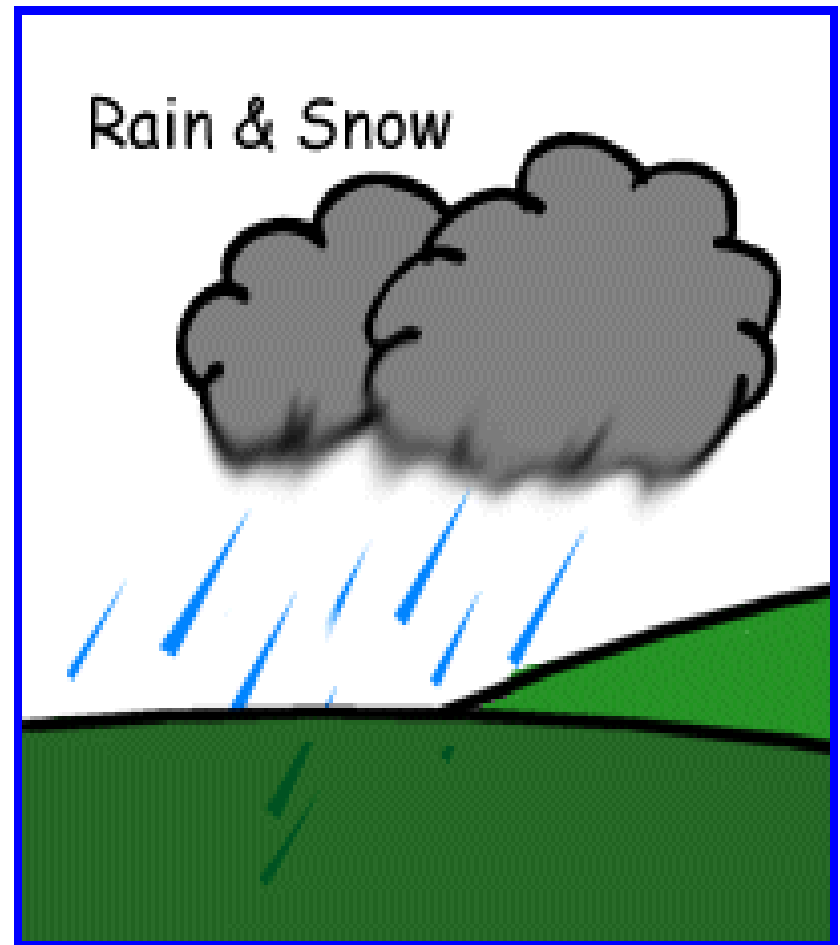
- **Plant Sweat = Transpiration**

- Transpiration happens when plants give off water vapor through tiny pores in their leaves. This is the plant's way of getting rid of waste, just like people and animals sweat when they're hot! This water vapor evaporates into the air and is stored in the atmosphere until it becomes clouds or precipitation
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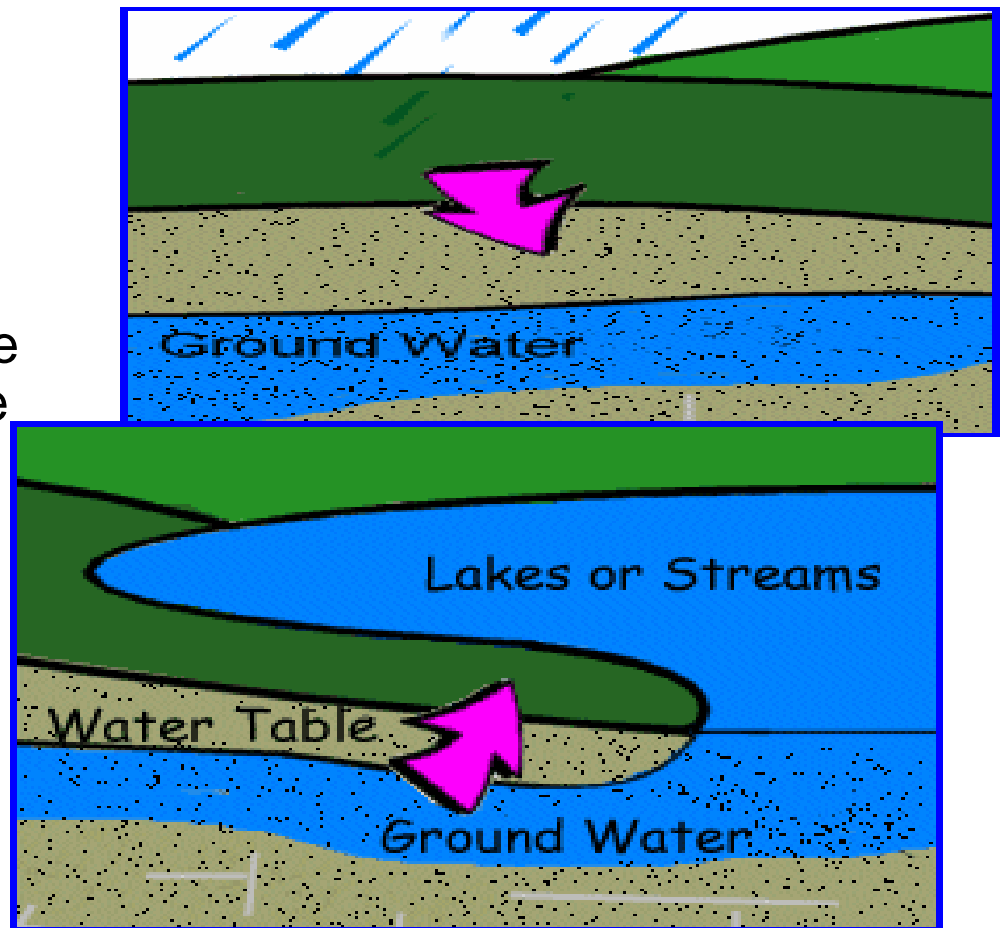
Water vapor is water in a gas form that is held in the air until it changes back to water. You know, sometimes it's sticky outside in the summer - that's just water held in the air. The water can change into fine droplets by "condensing" in the air, and we get clouds. When the droplets get big enough, they are pulled to the earth by gravity as precipitation, better known as rain, sleet, snow, hail, dew, or frost.



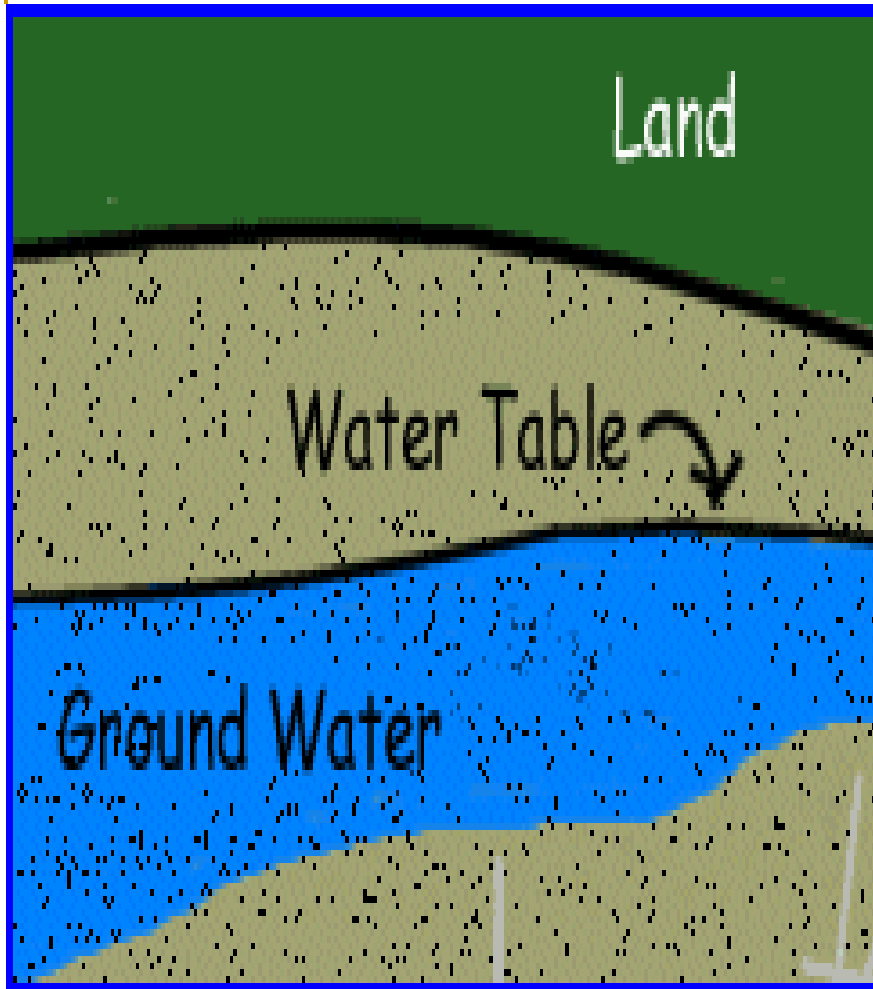
- **Watered Down = Precipitation**
- Precipitation is made up of any type of water that falls to the earth like snow, hail, mist, or rain. Here in Wisconsin, we get about 30-32 inches of precipitation every year. Most of it (80 percent) evaporates or transpires through plants and never reaches lakes, streams, or ground water. The rest, about 6-10 inches of precipitation, runs off the land into lakes, streams, wetlands or rivers (also called "surface water"), or, it soaks right into the ground



- Infiltration happens when water soaks into the soil from the ground level. It moves underground and moves between the soil and rocks. Some of the water will be soaked up by roots to help plants grow. The plant's leaves eventually release the water into the air through the plant's pores.
- Some of the water keeps moving down into the soil to a level that is filled with water, called ground water. The very top of this layer filled with ground water is called the water table.



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- For every inch of water that runs off the land into surface water, three inches seep into the ground to the water table in southern Wisconsin. In the middle of the state where we have sandy soil, nine inches of water seeps into the ground for every one inch that runs off the land into surface water.
-



The Water Table is found underground where the rock and soil begin to be filled or "saturated" with water. It also marks the very top of the ground water layer.

Where the water table meets the land surface, a spring might bubble up or seep from the ground and flow into a lake, stream woodland, or the ocean. When ground water meets the land surface, it flows out and helps keep rivers, streams, lakes and wetlands filled with water.

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- Why is the water cycle important to know?

It provides us with water supply in the ground and in rivers and lakes.

It is how nature creates drinking water for plants and animals.

Drinking Water

The text "Drinking Water" is rendered in a large, elegant, cursive-style font. The letters have a vertical gradient, transitioning from a light blue at the top to a teal or green at the bottom. A subtle 3D effect is achieved by a lighter blue outline or shadow on the left side of each letter. The text is positioned in the upper half of the frame. The background is a solid, deep blue. At the bottom of the image, there are several faint, concentric circular ripples, suggesting water droplets or a calm surface.

Making Potable Water

- What does Potable mean?

POTABLE means
water that is SAFE TO
DRINK



- Today many communities have to make their water safe to drink by treating it.
- Why would water have to be treated before it is used?



Why Treat Water?

- Pollutants: Before the clean water act, anyone could dump any type of waste into lakes, rivers, and streams
- Natural problems:
 - Lakes have growth of algae
 - Some water sources have high metals or other compounds (like nitrates)

Water Department 2007

- 9 Drilled Wells in 2 Well Fields - East & West
 - 4 Elevated Tanks
 - Nitrate Removal System
 - 91.7 Miles of Water Main
 - 800 Fire Hydrants
 - 4,902 Services
 - 5,422 Meters set
- 
- The bottom right corner of the slide features a decorative graphic of several concentric circles, resembling ripples on water, rendered in a lighter shade of blue against the main background.

East Well Field

➤ Constructed 1962

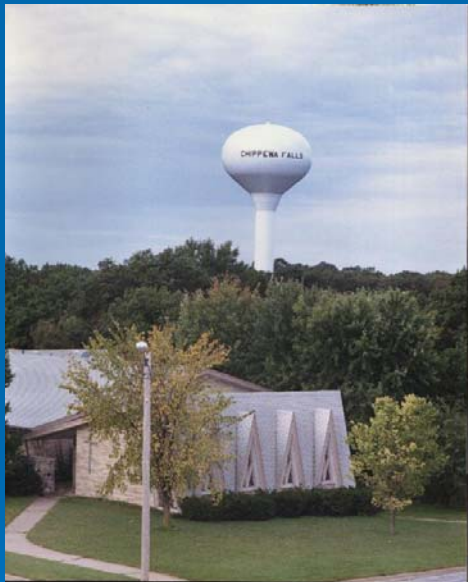


Nitrate Removal Facility

Constructed 1998



West Hill Tank



750,000 gallons
150 feet

East Hill Tank



1,000,000 gallons
150 feet

Water Towers



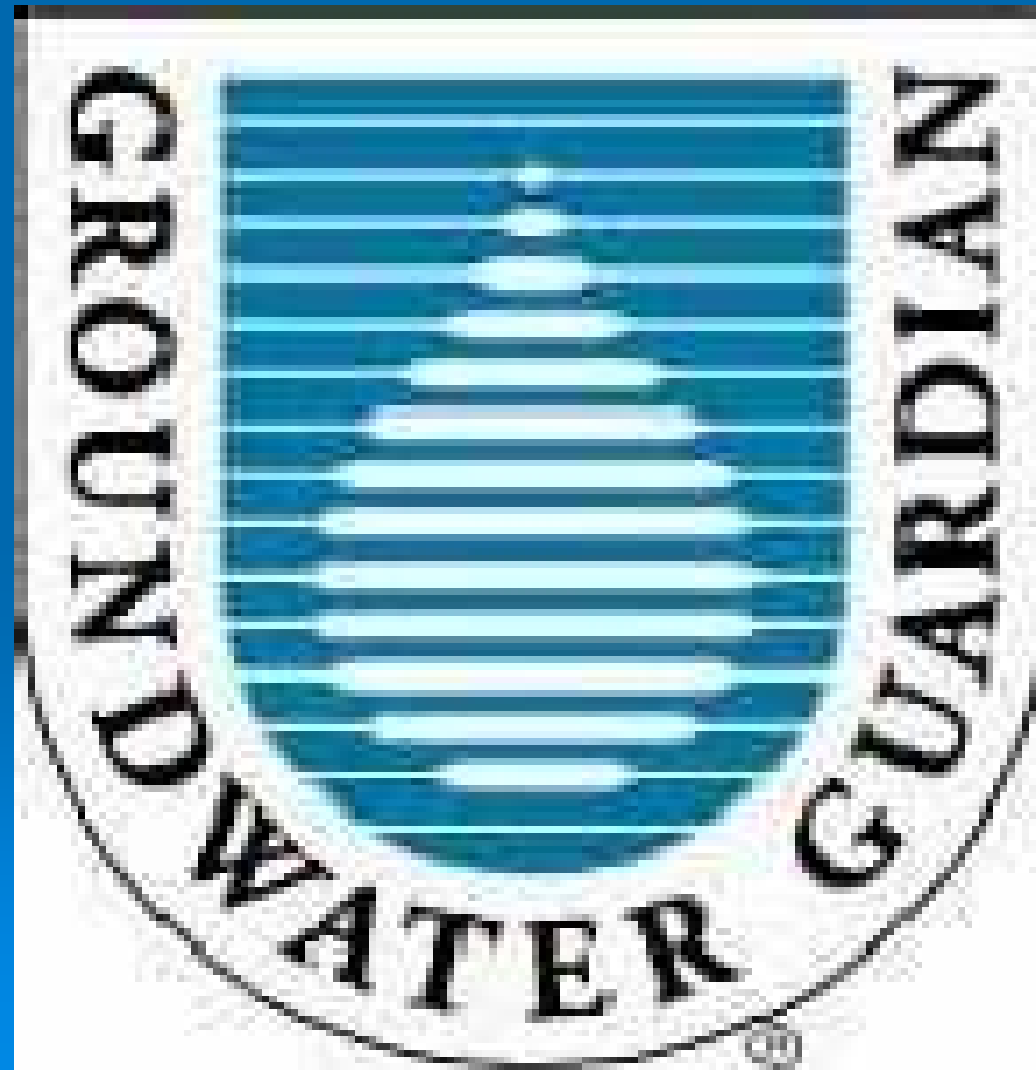
This is the inside of a tower.

When you look at a water tower, what you see on the outside is actually a specially designed building to protect the actual tank.

Is that all there is to making water drinkable?

- Many communities like Chippewa Falls have clean enough water supplies so they don't have to do much to treat the water. But what about those communities that don't?
- There are many different ways to treat water.
- Most communities use a series of filters.
- Communities also try to protect the source of their drinking water.

Groundwater Guardian Community Since 1996



What happens to water after we use it?

- Water must first flow through the pipes in the building then flow to the pipes that are in the street.
- Water flows by use of gravity. To do this, pipes are put in at a slight downward angle.
- Sometimes, because of the shape of the land, we end up getting to far down in the ground.
- Then the wastewater is collected in a “wetwell” and pumped up to a higher elevation.

Lift stations



Why Treat Wastewater?

“Pollution”

Wastewater has high amounts of
nutrients

The high nutrients causes an increase of plant
growth and cause many problems in lakes and
streams

And because the LAW requires us to treat wastewater



In Wisconsin, the DNR is responsible for issuing discharge permits and making sure the permit holder follows all requirements in the permit.

Chippewa Falls Wastewater treatment plant supervisor (in black coat) discusses how well the plant is working with DNR Environmental Engineer Steve Thon.

Now that you know
why.....

**How do you treat
wastewater at Chippewa
Falls?**

Wastewater Treatment Facility



Wastewater Department in 1950

- Primary Treatment Plant
- 2 Lift Stations

5/7/2008

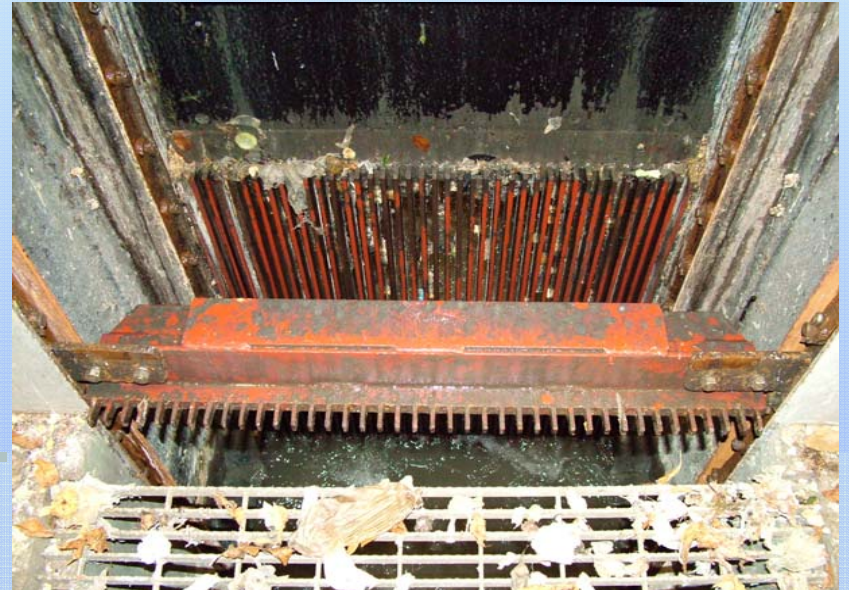
Wastewater Department Today

- Secondary Treatment Plant
 - Activated Sludge
 - Biological Phosphorous Removal
 - Biosolids Thickening & Dewatering
 - Chlorination/Dechlorination
- 12 Lift Stations
- Combined Stormwater Detention Basin
- 200 Acre Farm - Town of Wheaton

5/7/2008

Why do you think we
had to add to the
treatment process?

Pre-Treatment



Pre-Treatment



Primary treatment





Aeration Tanks

- Aeration means that is has oxygen
- This is where the biological treatment occurs
- After the aeration tanks the water flows into one of 3 final clarifiers



Aeration Basins

- Just like us, the good bugs need air to live
- We have to provide that by using engines that blow air into the aeration tanks.





Final Clarifiers



Chlorine Contact tank



- This is used only during the warm months – May through the end of September.
- Chlorine is added to the water, allowed time to kill pathogens, and then de-chlorinated with sulfur dioxide before discharging into the river.

Outfall to Chippewa River



River Diffuser



New Outfall to Chippewa River



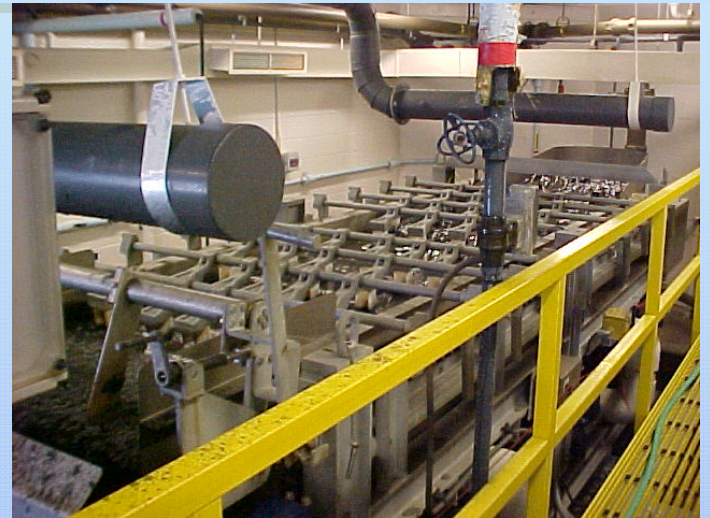
Recent Issues In Wastewater

- Copper Effluent Limit Violations
 - **River Diffuser Construction**
- Local Copper Limits for Industry
 - Implement Revised Ordinance
 - Reissue CFWD Permits
 - Work with Local Industries

WAIT!

What happens to the solids
that goes to solids handling?

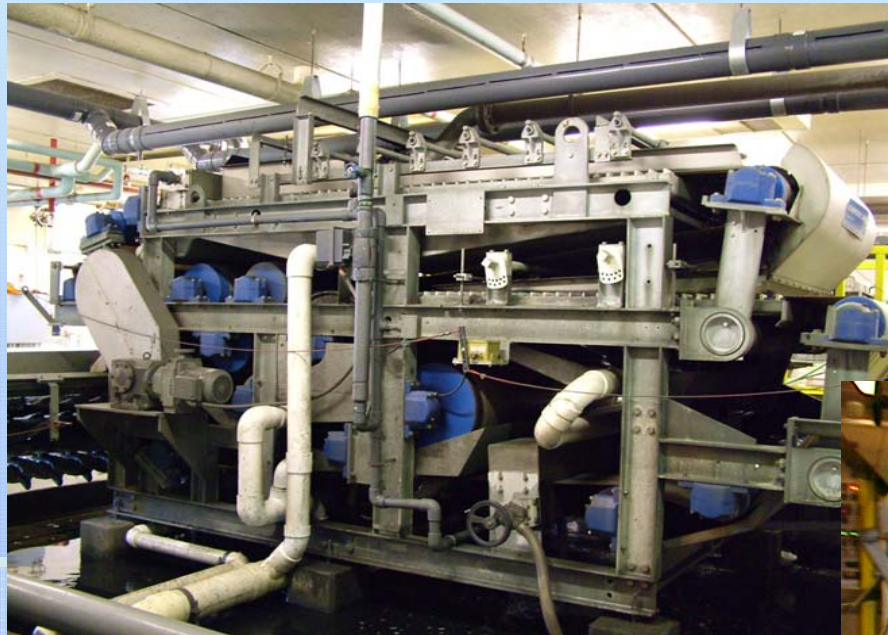
Gravity Belt Thickener



Anaerobic Digesters



Gravity Belt Press





Dewatered Biosolids



Biosolids Storage



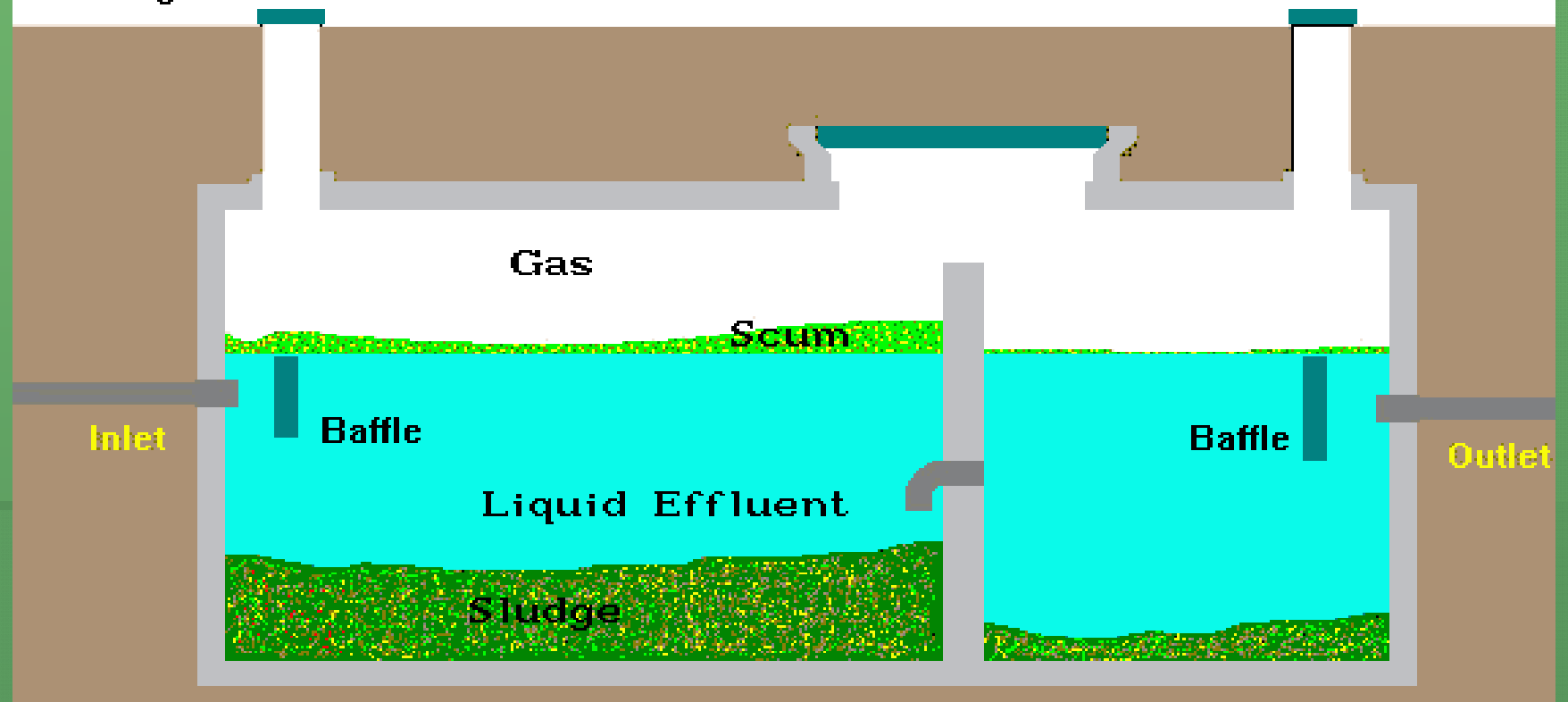
Biosolids Application



What if you live in the county?

- If you live in the county you probably have what is called a septic tank.
- Water that you use goes through the pipes to your tank. There, the solids sit and water drains out the other end into a drainage field.
- A septic tank is kind of like a small primary tank and anaerobic digester all in one.

Baffles are used in some septic tanks to prevent the water entering and exiting the tank from disturbing the still water in the tank. They are small walls that shield the inlet and outlet holes. The baffles must be properly placed to prevent the water in the tank from being disturbed. If the water is disturbed, solids will be mixed in the water and will leave the tank, clogging the disposal field. Therefore, the baffles should be protected during tank installation and cleaning.



- About every 3 years, a septic hauler will pump out your tank. (If you can smell it, then it is probably time to get it pumped out.)
- Once the tank is emptied, the Septic Hauler will then either spread it onto a field or bring it into a treatment plant.

Bring it All Together

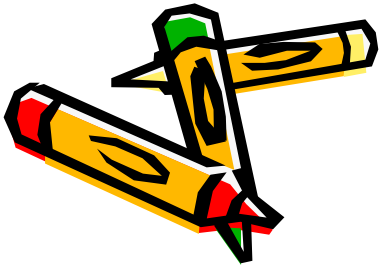
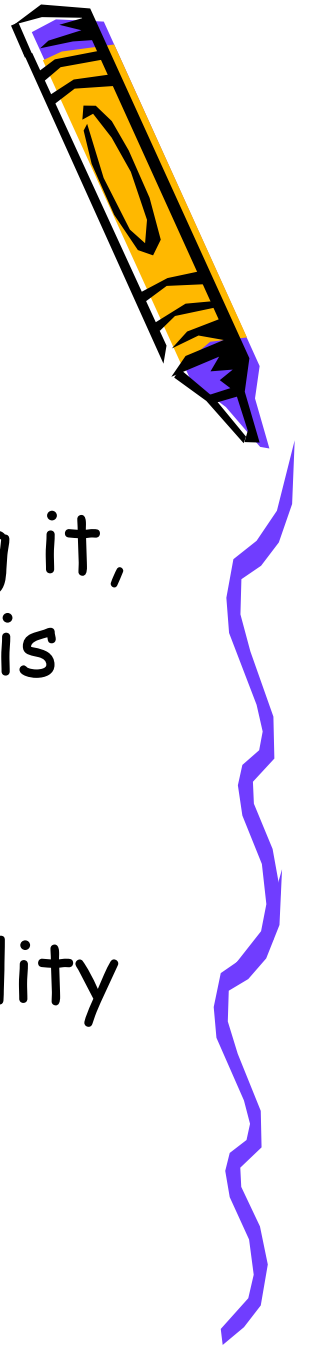
- I went to college to learn about water resources. I had to study things like microbiology, geology, forest soils, mechanical science, hydrology, chemistry, math, English, and many other things.

Why did I have to study so many different things...How is it all related?



Back to the Beginning

- Our taking water from lakes or aquifers, treating it to drink, using it, and then treating it after our use is all part of the water cycle.
- The quality of water returned to nature will directly affect the quality of water that we try to use next.



Water Facts and Conservation Tips

Did You Know?

- * There is about the same amount of water on Earth now as there was millions of years ago.

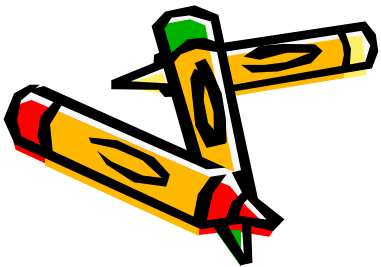
- * Nearly 97 percent of all the world's water is salty or otherwise undrinkable. Another 2 percent is locked in ice caps and glaciers. That leaves 1 percent for all our needs.

- * Water regulates the Earth's temperature. It also regulates the temperature of the human body!

- * The average total home water use for each person in the U.S. is about 50 gallons a day.

- * More water is used in the bathroom than any other place in the home.

- * A dripping faucet can waste up to 2,000 gallons of water a year.



You Can Help Conserve Our Water Resources



At school and at home, you can help protect our water resources.

Turn off the tap in your bathroom while you brush your teeth.

Take shorter showers. (Get a timer and time yourself.)

Don't let the water run constantly while you're washing or rinsing dishes.

Fill a pitcher with tap water and put it in the fridge, rather than running the tap every time you want a cold drink!

Clean sidewalks and driveways with a broom--not the water hose!

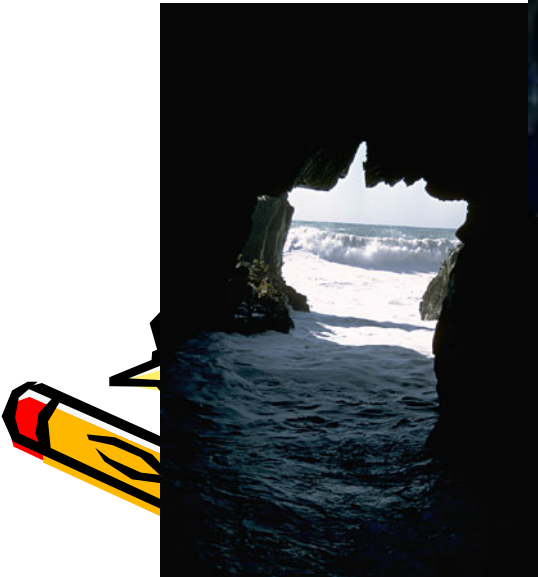
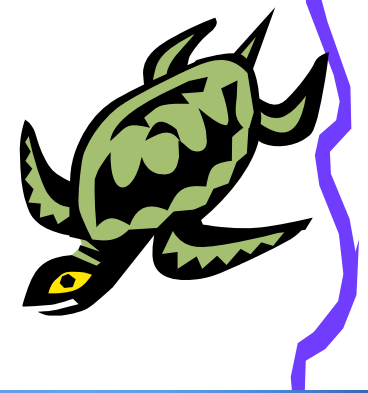
Water your lawn in the early morning to avoid evaporation.

Repair dripping faucets.

Place a layer of mulch around trees and plants to retain water.



Thank you for Inviting me to
your class!



Other interesting facts

- Most of the Fresh water supply is in Antarctica (around 90%)
- The sun evaporates about a trillion gallons of water per day.
- Around 6,800 gallons of water are needed to feed a family of four for one day.
- "Freshwater animals are disappearing 5 times faster than land animals."
- Source: <http://www.lenntech.com/water-triva-facts.html>



Information on Wisconsin

- "Wisconsin has about 1.2 million billion gallons (4.5 million billion liters) of water underground- if it were above ground, it would submerge the state in 100 feet (30 meters) of water."
- Dairy cows need about 45 gallons of water to make about 12 gallons of milk.
- Wisconsin's public utilities draw around 600 million gallons per day (the wastewater plants discharge about the same amount per day).
- We receive an average of 32 inches of rain-only 6-10 inches becomes groundwater.

Source:

<http://www.aqua.wisc.edu/WaterLibrary/facts.as>

